

## AMENDMENTS TO THE SPECIFICATION

**Please replace the paragraph on page 1, beginning at line 3, with the following amended paragraph including the addition of the heading:**

### BACKGROUND OF THE INVENTION

The present invention relates to a multi-purpose aqueous cooling lubricant suitable for the mechanical working of many different metals and alloys. The cooling lubricant, containing as essential components a phosphate ester compound and a dicarboxylic acid, contributes to excellent corrosion inhibiting and lubrication properties.

**Please replace the paragraph on page 1 beginning at line 14, with the following amended paragraph:**

In order to mitigate the negative effects of the alkanol amine, anionic surface active components with long aliphatic groups, such as groups with 14-44 carbon atoms have been added. Exemplary components are phosphate esters, fatty acids and dinner acids. Their protective action depends on the formation of water-insoluable, organic layers on the metal surfaces. If, however, dissolved di- or trivalent metals exist in the cooling lubricant, the aninic components will form water-insoluable salts with these metal ~~metals~~ ions. This may sometimes further increase the corrosion inhibiting effect, but it will also lead to the formation of an undesirable [a] sticky precipitation, which, e.g., tends to interfere with the purification of the cooling lubricant. Another drawback is the difficulty to remove the hydrophobic layers formed on

the metal surfaces. If they are not removed, they could cause problems in the subsequent surface treatments, for example pickling, phosphatizing, galvanizing or other metal depositing processes. The presence of the long chain anionic components may also cause undesirable foaming and scum.

**Please replace the three paragraphs on page 2, beginning at line 1, with the following three amended paragraphs including the addition of the heading:**

EP-A-0180561 describes the use of a tertiary alkanol amine compound for reducing the release of cobalt. According to the application, the tertiary alkanol amine compound can advantageously be combined with carboxylic acids to further increase the protection against the release of cobalt and the corrosion of iron.

DE-OS-2 943 963 discloses the use of an alkanolamine salt of alkenyl succinic acid as a corrosion inhibitor in aqueous solutions and US patent 4 670 168 describes a metalworking composition containing a water-soluble polyalkyleneglycol and a neutralized ~~neutralized~~ or ~~partly-neutralized~~ partially neutralized alkenyl succinic acid.

#### SUMMARY OF THE INVENTION

According to the present invention it has now been found that the above mentioned problems may be reduced or eliminated by using a combination of a phosphate ester and a dicarboxylic acid as a lubricant and an anti-corrosion

agent in an aqueous metal working liquid, whereby the dissolution and discoloration of several metals, such as cobalt, copper, zinc, lead, aluminum and iron, and their alloys are effectively hampered. In more detail, the present invention relates to a process for the mechanical working of metals, which is performed in the presence of an aqueous cooling lubricant having a pH of 6-10 and containing a phosphate ester of the formula



where  $R_1$  is an alkyl group with 1-12 carbon atoms, oxyalkylene is a group containing 2-4 carbon atoms,  $n$  is a number from 1-20,  $X$  is hydroxyl,  $R_1\text{O}$  or the group  $R_1(\text{oxyalkylene})_n\text{O}$ , where  $R_1$ ,  $n$  and oxyalkylene have the above-mentioned meanings, and  $m$  is a number from 4-40, or a salt thereof, and an alkenyl substituted succinic acid of the formula



where  $R_2$  is an aliphatic group with 4-10 carbon atoms, or a salt thereof, or a mixture the compounds I, II and III. The total amount of compounds I and II is from ~~0,2~~ 0.2 to 5% by weight, preferably ~~0,4-3%~~ 0.4-3% by weight and the amount of compound III is from ~~0,2~~ 0.2 to 5% by weight, preferably ~~0,4-3%~~ 0.4-3% by weight. The salts of the phosphate ester and the succinic acid are preferably formed of monovalent cations, such as potassium and sodium.

**Please replace the paragraph on page 3, beginning at line 9, with the following amended paragraph:**

The succinic acid of formula III contains an aliphatic group  $R_2$  which can be a straight or branched alkenyl. Examples of alkenyl groups are octenyl, decenyl, di(isobutenyl) and tri(propenyl). Preferably the alkenyl group contains 7-9 carbon atoms. The succinic acids of formula III exhibit, in addition to their excellent lubrication and anti-corrosion, also low foaming, which is of essential importance in a metal working cooling lubricant.

**Please replace the paragraph on page 3, beginning at line 19, with the following amended paragraph:**

Examples of suitable additional corrosion inhibitors are amine compounds, such as triazole and thiadiazole compounds and inorganic compounds, such as alkali metal hydroxides and boric acid, and reaction products between boric acid and/or carboxylic acids and organic reactants, such as alkanol amines. The content of these additional corrosion inhibitors may be up to 3% by weight of the cooling lubricant. Although the cooling lubricant containing the anionic surfactants I, II and III has an adequate lubrication ability for most applicants ~~it~~ there may be occasions where improved lubrication is desired. Examples of suitable lubricants to be incorporated into a cooling lubricant according to the present invention are those selected from the group consisting of esters or amides of mono- or

dicarboxylic acids having at least 12 carbon atoms in the acyl groups, organic aliphatic phosphate esters containing one or two aliphatic groups with 6-18 carbon atoms, nonionic alkylene oxide adducts with a molecular weight above 400, such as polypropylene glycols, glycols of randomly distributed propyleneoxy and ethyleneoxy groups and block polymers of propylene oxide and ethylene-oxide, and mixtures thereof. The content of these additional lubricants may be up to 3% by weight of the cooling lubricant ready for use.

**Please replace the two paragraphs on page 4, beginning at line 3, with the following two amended paragraphs:**

The solubilizers are usually low molecular weight compounds containing at least one hydroxyl group. The molecular weight is normally below 400. Examples of suitable solubilizers are propylene glycol ~~propyleneglycol~~ methyl ~~dipropyleneglycol~~ dipropylene glycol and ethyl ~~diethyleneglycol~~ diethylene glycol butyl ~~diethyleneglycol~~ diethylene glycol and butyl ~~triethyleneglycol~~ triethylene glycol.

When preparing a cooling lubricant according to the present invention, it is suitable to first prepare a concentrate, for example by first mixing the anionic compounds, I, II and II and water, and then the supplementary ingredients. The amount of water is suitably between 5 and 80% by weight of the concentrate. A typical concentrate according to the present invention has the following composition:

anionic compounds I, II and III	20-95, preferably 50-90% by weight
additional corrosion inhibitors	0-30, preferably 0-15% by weight
additional lubricants	0-30, preferably 0-15% by weight
water	5-80, preferably 10-50% by weight
other ingredients	0-30, preferably 0-15% by weight,

the weight ratio between the components I and/or II and compound III being from 1:15 to 15:1, preferably from 1:5 to 5:1.

**Between lines 23 and 24 on page 4, please insert the following new heading:**

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

**Please replace the paragraph on page 6 (after the Table) with the following amended paragraph:**

From the results it is evident that the cooling lubricant C of the present invention has excellent anti-corrosion properties and is superior to the comparison compositions as regards the lubrication ability.